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Everyone everywhere: A distributed and embedded paradigm for usability

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Abstract

We present a new paradigm to address the persistence of difficulties that people have in accessing and using information. Our idea consists of two main aspects: engaging wider society with usability and distributing the topic across disciplines. We claim that bad usability is a social justice issue. Primarily, we propose that usability should become the subject of widespread activism across society, enabling more people to realize that their usability problems are not due to inadequacies in themselves but in current designs. People should be encouraged and enabled to complain about their experiences with an expectation of improvements. We also propose that the current restriction of this topic to certain disciplinary units is overly narrow and that instead there should be radical embedding of usability concepts across many different fields and settings. We believe that the usability of information systems is core to information science and that information scientists should resume their historic role as heralds and pioneers of human–computer interaction.

1 | INTRODUCTION

In an Australian city where one of the authors lived for a number of years the City Council introduced parking meters with digital interfaces that had numerous usability problems. Locals were rather unhappy and voiced their concerns very publicly on social media. Citizens highlighted usability problems alongside the financial consequences of the new meters: both as taxpayers and as recipients of fines imposed for inadvertently overstaying meter times. The public backlash was such that the Council offered lunch-time seminars to explain how to use the new parking meters. Someone on Facebook jokingly asked if participants would be issued *Certificates in Parking Meter Use*.

This vignette illustrates the underlying rationale of this paper: society is embracing ever more technologies that use and share information. The new parking meters had significant advantages that even their critics acknowledged. For citizens the advantages included paying by credit card and using a dedicated app to manage their parking. For the Council it enabled the sharing and interconnection of information with other Council systems. Those advantages were overwhelmed by a poorly designed interface. The costs of fixing the interface are small compared to the costs of the overall system and the substantial benefits of a working system that people could actually use. As so often happens, a usability failure led to blame of the end users: it was "user error." Users lacked information on how to use the meters correctly and the obvious solution was training to fix the user (Schneier, 2016).

User experience advocates and researchers would likely agree that the wrong "information problem" was identified. Instead of fixing the user with information on how to cope with a poorly designed system, the time and effort should have been devoted to improving the meters. The public protest illustrates the alternative approach we are advocating.

Instead of just hoping that an elite of experts will identify and address usability issues, we need a cultural change across society of increased awareness and the empowerment of citizens to demand better user experiences.

Of course encountering such information problems is not limited to parking meters. We see similar issues in many settings—including in libraries where all too often the solution that springs to mind is to "fix the patron" through yet another training course, rather than demanding a better interface. We claim that:

1. Human–computer interaction (HCI) issues are critical to effective access and use of information. As such, information science has a vital role to play in advancing HCI.
2. Current HCI approaches have enabled substantial improvement in usability, but seem to have hit a plateau of effectiveness.
3. Something more is needed to complement existing HCI approaches.

We believe that part of the solution is substantially widening participation in discussions about usability and user-centered design, leading to more-informed end users who ultimately expect higher standards of user experience. This approach is inspired by how Ralph Nader encouraged Americans to expect higher safety standards in automobiles and not be solely influenced in their purchasing decisions by price and appearance (Nader, 1965).

We first provide a brief outline of the history of usability as it relates to information science, noting the great progress, but the persistence of usability problems. We then outline our suggested paradigmatic change and discuss the associated challenges.

2 | BACKGROUND

2.1 | Information science has informed and should inform HCI

When describing what she calls the explicit, above-the-water-line, paradigmatic definition of information science, Bates (1999) quotes from Borko (1968, p. 3):

> Information science is that discipline that investigates the properties and behavior of information, the forces governing the flow of information, and the means of processing information for optimum accessibility and usability. It is concerned with that body of knowledge relating to the origination, collection, organization, storage, retrieval, interpretation, transmission, transformation, and utilization of information.

Over the decades that have passed since Borko's (1968) article we have made much progress. We learned that different dimensions of accessibility and usability align with the elements of the information science paradigm that remain "below the water line." We also learned that accessibility and usability are different but intrinsically linked issues, but that they resist overly simplistic procedural solutions.

As Grudin (2011) notes:

> As more information is represented digitally, human–computer interaction (HCI) broadly defined, becomes more central to information science.

Grudin (2012) goes on to show how the information fields (including Library and Information Science, Information Retrieval, Digital Libraries, and those who work in Schools of Information) comprise one of the four fields informing HCI research:

> In the century prior to the advent of the first digital computers, advances in technology gave rise to two fields of research that later contributed to human–computer interaction. One focused on making the human use of tools more efficient, the other on ways to represent and distribute information more effective.

Grudin credits the ideas of Otlet and Bush as visions awaiting computing technologies to make their information use scenarios more widely feasible. This serves to remind us of the close but often under-acknowledged interconnection, indeed overlap, between the two areas.

One major and recurrent cause of usability problems was that as computing technology became cheaper over the past few decades, new applications for different settings became feasible. Computer applications came to be used by people whose main skill was not the operation of the computer, but the execution of a specialist work task that might be enhanced with a computer. The approach of providing people with computer applications that were designed by computer scientists either for their own use or for the use of other computer scientists did not work well. People did not have the time or inclination to learn how to be a computer scientist or think like a computer scientist simply to use an application to help them do their real noncomputer scientist job (Grudin, 2012). With falling costs and rising functionality computer systems

have pervaded workplaces, leisure, commerce, the home, and social interaction. Billions of people with varying interests, abilities, and needs are using computer systems for many kinds of purposes—and the interactions are not always well-designed for those purposes.

Over time, scholars and practitioners in the multidisciplinary fields of HCI and Interaction Design have assembled a readily available body of knowledge (e.g., the textbook by Sharp, Preece, & Rogers, 2019) that provides solid, field-tested advice on how to design, develop, deploy, and evaluate usable and useful interactive digital systems in diverse contexts. Recurrent problems have been identified and resolved, new user-centered design methods developed and the knowledge has been embedded in the computer science curriculum (ACM, 2013). And yet we keep seeing badly designed, sometimes barely usable systems. As Cooper (2018) points out, "many interfaces of new products do not even adhere to interaction design principles established through rigorous research more than twenty years ago." So we cannot help but ask ourselves: "Why? Is the existing approach inadequate?"

2.2 | Usability in information science

Information science is not immune to the impact of usability problems. Bibliographic databases were one of the first information resources to be computerized. Initially housed on expensive mainframes, and accessed by extremely expensive dial up, they were designed to be operated by highly skilled librarians who used complex Boolean queries to minimize online access times to obtain a desired result. Eventually as costs fell, Online Catalogues became Online Public Access Catalogues (OPACs). Access increased, but not necessarily accessibility through better usability, as noted by Borgman (1996). This is a nice example of a tool initially developed for specialized use by skilled people working to optimize use of scarce resources via a complex interface that became more affordable and more widely available, but then needed an easier to use interface.

There were certain notable cases of better usability being recognized as something that people wanted and that they would switch to if given a choice—even paying a premium for. Examples include the first Apple Macintosh computers, the Amazon e-commerce platform and Google. Increasingly librarians heard patron complaints such as: "Why is it harder to find things in your systems than with Amazon or Google?" These complaints were not restricted to the computationally naive. Even readers of this research paper may have caught themselves using Amazon or Google to find details of a book in preference to, or prior to, using their University Library's catalogue. Again the same issue applies, the library catalogue is optimized to do more powerful things than Amazon or Google (and may suffer legacy issues of being developed much earlier), but for a significant percentage of user needs, a simpler, easier to use system is preferable to a more powerful one that is a bit less easy to use.

This applies whether our system is an OPAC, a database, a digital library, a search engine, code repository, or a physical library. All have interfaces, and poor interfaces can cause poor access—a core value of librarianship (ALA, 2015). Just because the information exists and you have made it possible for people to access it, does not mean that the job is done. Can they find it? How hard is it to find and use? How hard does it really need to be?

2.3 | The persistence of usability problems

In one sense, this historic endeavor of issue identification and method development can be seen as a great success. Interfaces to many applications are better than they would be otherwise. Millions, indeed billions, more people are interacting with software and devices for large portions of their lives. We no longer see flashing "12:00" signs on video cassette recorders (VCRs) indicating that their owners did not manage to set the device's internal clock (of course we do not see VCRs much either, but we have many more devices with clock displays and they rarely blink at us).

However, this success seems to be only ever partial. As ever more applications integrate into our work, home, and social lives, there always seems to be new causes of confusion, even as old confusions are addressed. Why should that be, given all our expertise in HCI, the growing recognition of the importance of usability and the substantial growth in the number of usability practitioners? It seems that our growing supply of human-centered design abilities cannot keep up with the demand. This is surprising because insights into usability, such as Nielsen's heuristics for good usability (Nielsen, 1994) were developed almost 30 years ago and have (mostly) stood the test of time (Nielsen, 2005), for the good reason that "[the heuristics] depend on human behavior, which changes very slowly, if at all." Although we focus here on usability our observations apply to the wider "umbrella" term of user experience (Tractinsky, 2018).

Ross (2011) highlights a number of organizational reasons that can prevent identified usability problems from being resolved. Other partial causes of persistent usability problems involve inertia, a sense that the issue was someone else's problem, that the costs of improving

usability were more visible and more immediate than the benefits, and that there was insufficient buy-in from senior management. Another possible cause was a belief (perhaps incorrect) that customers did not seem to be all that bothered, and were unwilling to pay extra for better usability.

Achieving practical usability improvements is not a goal in itself. As information scientists we know how the nature of an interface impacts on the information experience: "If we only look through the interface, we cannot appreciate the ways in which the interface itself shapes our experience" (Bolter & Gromala, 2003, p. 9). This quote is from a discussion of digital art but examples from information science are common. Whether it is Salton's (Salton & McGill, 1983) game-changing subjective view in information retrieval or the lasting impact of Belkin's (1993) approach to interactive information retrieval, in all these cases we learned that we, the people using retrieval systems, change in the interaction with the information on display: "[the information problem] evolves and changes as the search and the overall situation evolve" (Marchionini, 1995, p. 36).

In order to achieve significant usability improvements, we certainly do not condone vigilante-style naming and shaming of designers. That is incompatible with the values that we are promoting. Instead of blaming developers for a poorly designed interface that fails to meet people's varied needs and capabilities ("Wow, what idiot designed this?"), Rosenstein (2018) suggests asking "What constraints were the team coping with that made this design seem like the best possible solution?" Designing, developing, and deploying interactive digital systems is a complex process and the commercial reality is that usability may not even be amongst the most important criteria.

Typically businesses respond to consumer demand, but the question that arises is why do people put up with bad interfaces? What is holding us back from expecting—and demanding—better usability just as we now expect better safety when purchasing cars?

2.4 | Why do people put up with bad interfaces?

Despite all the hard work of those advocating for usability, showing how small additional expenditures can yield dramatic improvements in learnability, efficiency and indeed safety, we still have problematic interfaces. It is almost as if some people are in something weakly analogous to a Stockholm syndrome relationship with their interfaces (we are deliberately picking an extreme analogy to highlight the absurdity of certain reactions to bad design). They make excuses for the usability problem, blame themselves, try to hide the cause of the problem, and even deny that there is any problem. They can feel demeaned and that they do not deserve anything better. They can be surprised to discover that they are not the only one with similar problems. It seems very odd and tragic to us as usability researchers and teachers.

It is a frequent occurrence in teaching usability that at some stage an engaged student will make a series of transitions from: "This is too hard," "I don't understand it," or: "I don't see the point because I understand computers" to: "But this is so obvious!," "Why does bad usability persist?," "Why don't people just fix it?," "It's so easy to fix, why doesn't it just happen?" Resisting the temptation to say "Don't knock it; job for life," we struggle to give adequate answers to these perceptive questions. We do not really know either. But we do have some ideas of at least partial causes.

It is quite common for people to blame themselves for any errors or confusions rather than the interface (Norman, 2013, p. 65). Indeed, one of the techniques in preparing people to participate in a usability study is to reassure them that errors are not their fault. This widespread self-blame phenomenon lowers self-esteem, self-confidence, and the chances that the affected person will expect or demand better interfaces. Some people have an understandable but regrettable assumption that computer applications are necessarily difficult to use, or only difficult for them to use while being easy for others due to some personal failing in intelligence or experience. It discourages people from using certain applications, or trying more advanced features.

Problematic interfaces do not just affect those who lack technical confidence and expertise. One of the authors who have a degree in computer science, a doctorate in informatics as well as years of experience as a programmer had that experience when he struggled to get the audio-visual system in a lecture hall to play a movie clip: the sound remained elusive no matter what was tried. Written student feedback collected at the end of the term included an isolated statement that it was "embarrassing" to see a professor struggle with technology in front of technology students.

This little anecdote is likely to resonate with many of us. People who read research papers like this one are likely to be highly educated, and technically adept, especially compared to the general population. And yet we too can be embarrassed by technology. Imagine how much worse it is if you do not have all the privileges of being an information science researcher. In many more cases we suffer a series of petty humiliations with bad interfaces on a daily basis—but in private. The anecdote

helps make the issue more visible because it occurred in public. And yet even then what happens? We avert our eyes. We treat this as inevitable. We blame the user. We propose solutions involving more training. We do almost anything other than remark that this is ridiculous and why do not we do something about it.

One of the authors was at a meeting where ideas were solicited for blue skies research projects that might be funded. He suggested a moonshot program to design a technology so that presenters could switch over to present in turn from their laptops in 10 s or less, without needing a tech person to help them. This wry comment was initiated by the difficulties observed in the previous blue skies pitch handovers. The audience laughed loudly, but then shook their heads and moved on to challenging blue skies ideas that were more feasible and more fundable. This acceptance of bad interface design is not just due to passivity and ignorance on the part of uninformed end users lacking in technical confidence. We are all complicit in a failure to complain, and so we need to move to a more activist stance. This is not just a case of well-meaning people wanting to do something for the silent and powerless. It is about stirring up discontent, helping people realize things could be otherwise. It begins by helping society recognize that confusion is not necessarily the fault of the end user. Confusion can be the result of bad design.

Shneiderman (2000) stressed the importance of universal usability to improve access and usage of information and communication technologies, but framed the problem in terms of better outputs from researchers and developers rather than our focus on promoting end-user agency. Lewis (2014) suggests that "perhaps UX [user experience] will become part of a larger customer experience effort, especially given recent emphasis on service design and the emergence of the discipline of service science." There is a substantial literature on user frustration. For example, Ceaparu et al. (2004) focus on characterizing user frustration in terms of applications, proximate causes and lost time. By contrast, we want to raise the issue of empowering the end-user to do something about their frustrations.

Bad interfaces can affect rich and poor, those with substantial technical expertise and those with little. However like so many things, the consequences of the problem are typically much worse for those with less power, education, and privilege. We claim that bad usability is a social justice issue. Consequently, it is particularly egregious to first blame the end user for errors, and then to adopt a training regime for these users to conform themselves to a badly designed product. We agree with Lewis (2014) in trying to generalize usability concerns to wider society but propose a new paradigm to achieve success: distributed activism.

3 | CHANGING THE PARADIGM: DISTRIBUTED USABILITY ACTIVISM

A truism in HCI is: "As far as the customer is concerned, the interface is the product" (Raskin, 2000, p. 5). As noted, HCI has made great progress, but the usability problem of poor interfaces is not solved. It is not that we do not know how to build good, usable systems; it is just that quite often that body of work does not seem to have had the impact we would expect to see.

Many studies of technical disasters and accidents, including plane crashes, medical failures and nuclear emergencies seem to end up with a conclusion of the cause being "operator error" and a proposed remedy of greater staff training in the future. Norman (2013, p. 66) describes how assumptions embedded in the legal system in the United States allow official investigations of major accidents to basically be concluded once "human error" was identified and the people involved could be blamed. Norman argues this should be treated as system error as opposed to human error since the operator error is at least in part caused by poorly designed, confusing interfaces. In fact, we argue that the default should be to regard the provision of substantial training as indicative of potential interface design failure—even if it is not currently possible to improve the interface. In addition, such training may indicate that insufficient consideration was given to usability in the earlier specification/purchasing/tailoring process.

The current paradigm includes usability as part of the computer science curriculum (and also increasingly in curricula in Schools of Information (iSchools)) and usability consultants providing specialized services in industry. As noted above, that approach has had many successes, but does not seem to be sufficient. The approach also has certain features that we consider less than ideal. It focuses on an elite of experts doing things *for* relatively disempowered groups of users who are often seen as the causes of problems rather than solutions.

We propose to invert this arrangement: to promote distributed usability through mass awareness leading to usability activism across society. This involves everyone who uses interfaces, not just usability experts. Bias, Marty, and Douglas (2012) observed in the context of classes they taught at iSchools that usability skills turned out to be valuable to have even for students that were not going to be employed in usability related professions. Similarly, Lueg (2020) argues that all

computing technology students should understand the basics of usability.

The challenge is to consider how we could empower all citizens to become activists for better user experiences, not least by complaining about current poor experiences. This approach implies greater participation and direct involvement in research by people than is typified by occasions when we call people "users" or "human subjects" (Guterman, 2007). The term "consumer" can also appear rather passive, and yet over many decades we have seen the consumers of certain physical products become more active, indeed more activist. We want to validate and encourage something similar for computational and informational products.

Today's market for automobiles contains many regulations and constraints for manufacturers. These current legal restrictions did not arise accidentally: in the United States, they are partially the result of *activism* to produce the "political and media forces necessary to achieve the goals of the 1966 motor vehicle safety law" (Nader, 1991). To generate similar forces for better user experiences requires a reconsideration of current practice. Tractinsky (2018) observes that usability is an "umbrella" term that can be so broadly applied as to impede theoretical analysis. However, the general applicability of usability across life experiences is what enables mass activism in this domain to be conceivable. User experiences are, after all, more general than vehicle-related experiences. We start our alternative paradigm by considering citizen-initiated communication of the personal experience of usability incidents.

3.1 | Everyone: Encouraging more complaining

Teachers and practitioners of user-centered design commonly share examples of poor interfaces as teaching resources. There are hashtags (e.g., #uxfail) on social media, posts on Reddit (Chivukula, Watkins, McKay, & Gray, 2019) and students often share the examples they encounter. However, these discussions are largely confined to specialized channels or educational settings. Extending these practices to make them widespread would make problems more visible and encourage greater interest in addressing issues as fixable or at least improvable problems rather than being treated as a somewhat inevitable petty annoyance of modern life.

As mentioned earlier, usability practitioners commonly reassure participants in user studies that *they* are not being tested—it is the *system* that is being evaluated. While this is valuable for data collection and even rather liberating for the participants, we should aim to tell *everyone* that most of the time their confusions are probably not their fault. One way to legitimate and encourage more complaining may be to help people realize that they are not alone in their personal confusions. We already encourage people to vote. Another kind of democratic engagement is to encourage people to complain—and to design better ways that their complaint-vote can be cast. As with voting, it is tempting for an individual to wonder if it is worth the bother. And as with voting, the answer is that collectively it is, and doing nothing is an action that reinforces the inequities of the status quo.

3.1.1 | Examples of reporting and complaining

Hartson and Castillo (1998) noted the potential for remote end-user usability reporting centered on critical incidents. Another strand of work has focused on simplifying the experience of reporting usability issues in the context of open source software projects (Nichols, McKay, & Twidale, 2003). Nichols (2003) briefly considered "complaining" channels in all software but with a narrow goal of bug-fixing and without consideration of publicizing the issues to a mass audience. This work also noted the difficulty of using (or even locating) channels to report issues back to developers. Public forums can be mined for usability issues (Ko, 2012) but, in the case of software, they likely represent more technically sophisticated users. However, these investigations have not delivered a widespread implemented solution and even reporting mechanisms for skilled users are limited through inconsistent terminology, lack of structure, and limited use of multimedia (Yusop, Grundy, & Vasa, 2016).

Simmons and Brennan (2017) provide a framework and motivating examples for the use of consumer knowledge as a source of improvement in public services. Pak, Chua, and Vande Moere (2017) note that "defects in the urban environment may be costly for the government to systematically track from the top down, yet may be easily catalogued with the collective efforts of citizens from bottom-up." In business, customers have long been acknowledged as a potential source of product improvement and innovation (e.g., "customer knowledge enabled innovation"; Belkahla & Triki, 2011). Organizations can potentially extract patterns of user frustrations from end-user support channels such as help desks; however, in practice individual consumers do not feel empowered to influence large corporations through their individual experiences of product usage.

In the context of local government, Simmons and Brennan (2013) claim that "citizens may often require encouragement to complain": they note uncertainty over how to complain and an expectation that complaints

would not be listened to. Practical approaches to lowering the transactional costs of complaining include a variety of web portals and mobile apps focused on the relationship between citizens and local government authorities (Certomà, Corsini, & Frey, 2020). For example, Bousios, Gavalas, and Lambrinos (2017) describe a mobile application to crowdsource "daily life issue reports" to prioritize local government actions. The prototype system does structure and aggregate citizen requests but these are only viewable by officials—which impedes its value for contributing to mass awareness. SeeClickFix (Berkowitz & Gagnon, 2017) extends this approach in providing public documentation of complaints and updates on progress for reporters.

In addition to the transactional costs of complaining is the expectation that the complaint would not produce meaningful action (Simmons & Brennan, 2013). Many years of putting up with bad interfaces and a belief that companies (and indeed nonprofits, education providers, and government agencies) simply do not care if you struggle to use their online tools, apps, and so on can understandably lead to fatalism, hopelessness, and apathy. One way to dispel such attitudes may be to share cases of how a complaint led to a change that benefited not just the complainant but hundreds or millions of others. Simmons and Brennan (2017) share examples of cases where complaint-driven change was effective; however, the case studies were aimed at those inside organizations. Change stories to encourage public engagement will likely need to be focused on end-user benefits rather than internal business processes.

3.1.2 | Having a language and a venue to complain about interfaces

When citizens have concrete examples and access to appropriate infrastructure then we can enable an attitudinal change to produce "active participatory informational consumerism." As we use information technologies, we should feel empowered to be critical of them, noting when they go wrong for us and asking for something better. We invoke the word consumerism in part because of the success of Ralph Nader (as noted above), but it is not an ideal term because it carries implications of passivity: whereas we want to create a culture of active feedback.

As well as legitimating the act of complaining, this approach may require helping people to have a language to use in their complaints. "It's awful!" is helpful, but explaining why you find it awful is even more helpful. It might be that we need more popular books like those that Don Norman has written over many years (e.g., Norman, 2013). They have inspired many to study HCI and become usability professionals, but have sadly not had the mass appeal and consequent impact in facilitating widespread discussions about usability that Nader's (1965) book *Unsafe at any Speed* had on automobile safety. Perhaps we need a book like *Unusable at any price*. Part of Nader's success may have been in helping people escape from fatalism, by enabling them to realize that it was possible to design safer cars, that we did not have to put up with high death rates, and that improvements need not be too costly. Knowing that things can be otherwise can be a significant component in making an issue more widely discussed and challenged.

An alternative to dedicated apps, forums, or other channels (such as helpdesks) is for complaints to be posted on social media sites. This approach has low costs for those users who already use the site and potentially high public visibility. When popular users complain, a company may feel obligated to respond—although there is a risk that these users may receive preferential treatment (Gunarathne, Rui, & Seidmann, 2017). Social media has some valuable properties as a complaints channel: easy-to-use, public visibility, and direct connection to developers or manufacturers. Public visibility allows others to share, vote, rate, etc. issues but also serves a psychological function of showing that your problem is not just *your* problem. In a world of social media influencers maybe usability awareness would be usefully served by celebrities showing their technology frustrations on Instagram.

3.1.3 | Reasons for optimism: Inspired by spit and dog poo

It can seem that changing public attitudes is just too hard, even if the attitude change is simply to make a problem more visible by increasing awareness. But it can be salutary to see how substantial change in ingrained activities can be achieved relatively quickly. It is not that long ago that spitting in public was widespread. Opinions changed, particularly around how spitting could be a vector for disease, and we can end up forgetting how this was achieved unless we see old photographs and museum materials showing "do not spit" signs in public transport. We rarely see "do not spit" signs nowadays because public spitting, although not eliminated, is both rare and widely seen as undesirable. A more recent example is the change in the behavior of dog owners. It is not that long ago that it was considered perfectly normal for people to let their dog defecate on a public footpath and leave the offending item there.

As a result of various initiatives, such behavior (again although not completely eliminated) is widely considered unacceptable. We note one creative initiative in

particular: the planting of little flags in dog poo to draw attention to something unpleasant but that people seemed to regard as inevitable and intractable (Chandler, 2014). But dog poo on the streets was not inevitable and intractable. We fixed it, in part, by making the problem (more) visible and unacceptable.

3.1.4 | Better, cheaper, easier metrics to influence design, purchasing, and adoption

In a commercial context, companies develop software to sell to consumers or to other organizations. There are typically competitor products and so the purchaser makes a decision weighing up desired features against price. Even in bespoke commissions, the purchaser makes decisions of what to ask for and the cost implications of each additional request. So why is there a usability problem? Surely free market competition should resolve this? Hard-to-use software should be as unsuccessful as hard-to-drive automobiles. It seems that there is some kind of market failure. Although functionality features and costs are carefully assessed in purchasing decisions, usability may not feature prominently. This could be because it is not considered, or it is regarded as too "soft" compared to the harder numbers used in price and performance data. The latter can feel objective while usability is seen as subjective. In a sense usability *is* subjective. It affects you as a person, and usability problems do not affect all people equally. But that is not a reason to ignore it. In part the failure seems to be due to a lack of a societal vocabulary to talk about usability, and in part the difficulty of deploying low-cost, easy to obtain, easy to use usability metrics that can be used to compete with the well understood metrics of dollars and feature counts.

Similar issues apply to the developers and consumers of software outside the corporate sector: government, education, nonprofits, and so on. That includes libraries, scientific data repositories, university administration, grant awarding bodies, and publishers, all of which affect information scientists as both consumers and service providers. Simple free market incentives may not apply here if there is a monopoly supplier. You may not be able to choose to use a different public library—or a different Internal Revenue Service. Sadly there can be an attitude that people should be grateful that the service is provided at all, and that usability is just fluff. Fortunately we have the history of librarianship as a principled challenge to such attitudes. Over decades, librarians have made great efforts to make their libraries more welcoming to groups of patrons who can feel that a library does not particularly want them, does not want to provide services for them or is "not for the likes of us." If we can make our libraries more welcoming, why not our information systems? And who better to help than librarians with a long history and culture of broadening access by identifying and addressing often subtle barriers to that access?

3.1.5 | Usability and consumerism

Consumer organizations, such as Consumer Reports in the United States and similar magazines in other countries, have helped purchasers make more informed decisions. They do this by detailed tests of competing consumer products, comparing features, effectiveness of those features and reliability. Much more could be done about usability-focused product comparisons from trusted independent sources, particularly with respect to informational and software products. Such comparisons can help both individual consumers, but also people in organizations charged with making decisions about purchasing. The total costs of bad usability over the life of a product are rarely computed. It is almost like we as a society do not want to know how much money has been wasted and how much irritation and misery caused.

As well as inspiration from Nader's work on automobile safety and Consumer Reports informing the purchase of domestic appliances, we might consider other attempts to help us as consumers focus on different aspects of the products we buy. These aspects might otherwise be invisible to us, but if made more visible and easier to understand, might inform our purchasing behavior, and indeed help us influence the behavior of others. Two examples are Fair Trade accreditation and Energy Star ratings. Both involve important aspects of the wider consequences of our purchasing decisions and product use that we may not otherwise easily see and consequently may not otherwise think or care about. Fair Trade status enables and thereby encourages us to think about the people who make the things we buy. Energy Star ratings enable and thereby encourage us to think about the wider costs of continuing ownership of the product both as it affects our finances and the planet. Both examples apply particularly where we have a choice between competing products. But also the absence of a Fair Trade option in a cafe may cause us to ask why there is no such option. Imagine what the impact might be of a Usability Star rating on a library catalogue. Or on a university's application process.

3.1.6 | Widening the case: "Usability Kaizen"

Mass participation may go beyond identifying usability problems to also involve suggesting simple low cost

improvements. This has precedent in manufacturing. The Japanese Kaizen system (Macpherson, Lockhart, Kavan, & Iaquinto, 2015) is particularly associated with the Toyota production line. One aspect is that all workers are encouraged to examine their workplace, note flaws and suggest better ways to work more efficiently, safely and with fewer mistakes. This can be contrasted with an approach that brings in trained management consultants as the only experts to be trusted to propose improvement. By analogy, we are advocating that interest in and activities to improve usability diffuse out beyond those with a specific designation of usability professional to involve a much wider circle of other experts and end users. Just as in the early days of Kaizen, some may be skeptical of the idea of involving people who actually use the tools in discussions about using the tools. This might be because these skeptics believe this is best left to experts, because they do not think the end users have much to offer, or because they do not think the end users should be burdened with an additional task of suggesting tool improvements. However, we think usability Kaizen is worth exploring. Indeed, it might be expanded to other aspects of information work, just as traditional Kaizen was applied to many different aspects of manufacturing work.

3.2 | Everywhere: Embedding usability in diverse settings

The second central element of our proposal for paradigm change is that of embedding usability activity, diffusing it across disciplinary and professional boundaries. To recycle a cliché, usability is too important to be left to usability professionals. It is also too important to leave inside a usability laboratory, particularly as some usability issues only manifest in the places where the software is actually used (Thomas & Kellogg, 1989). As we have argued, everyone should be involved in usability discussions, including end users. Their complaints are valuable data if only we would listen, and if only people believe that their complaints will be listened to—and acted on. Multiple professions have much to contribute to advancing broad usability improvement. Usability should be a concern throughout organizations, changing a perception of usability as "somebody else's problem." An individual in a team, just like a solitary consumer may not be able to fix a usability problem, but hopefully we can encourage them to feel empowered, even feel obliged to report a problem before it has too serious consequences. "Usability whistleblowers" might be valuable in reducing accidents, just as "usability incrementalists" could slowly improve productivity (as in Kaizen).

By distributing usability activity and attention across disciplines and organizational units, there is a risk that it becomes too diffuse to have an effect. This is a risk to be mitigated, because of the significant potential benefits. One of these benefits is to incorporate a greater diversity of voices into usability discussions. Much has already been achieved with respect to diversity within what we might call "traditional usability." HCI research still has a very long way to go in its representation, but it is already considerably more diverse than many areas of Computer Science (Sharp et al., 2019). Considerable progress has been made in making software more accessible to people with various physical and mental disabilities. Much more remains to be done, not least to take greater account of those excluded from full societal participation by barriers of cost or prerequisite knowledge. It seems reasonable to ask if there is a power difference between those who experience usability issues most acutely and those who make decisions. Even the most privileged members of society can be irritated by hard-to-use interfaces, so the problem is not exactly invisible to them, but the depth of the impact is much more severe when you lack the resources for alternative solutions.

Advocating for the importance of considering the actual needs and problems of end users is not a new idea. It is a bit depressing that we still need to make the case when it comes to interfaces. Doing this *with* affected people instead of simply *for* them is somewhat more extreme, although again not new—participatory design (PD) has advocated for this for decades (Bødker, Kensing, & Simonsen, 2004). The main difference in the case we are making is the scale of diffused society-driven distributed continuous feedback and improvement. Instead of working with a small number of co-designers around a table in a PD workshop, can we develop techniques to *also* (i.e., not to replace PD) make use of feedback, complaints, and ideas from hundreds or millions of people? That sounds noble—and also ambitious.

A recent example reveals the consequences of failing to consider the wider user experience in a nontraditional setting (Singletary, 2020). In the United States, the Treasury Department and the Internal Revenue Service (IRS) sent out pandemic economic impact payments to some citizens in the form of a debit card. Unfortunately the card was sent in plain white envelopes from an organization called "Money Network Cardholder Services." Even more unfortunately, many Americans have experience of receiving unsolicited credit cards in the mail and so often discard them unopened. Consequently, many people threw away their stimulus payment. There had also been numerous news reports about potential financial scams, often involving asking people to supply their Social Security number—a requirement of registering this debit card. Although the envelope contained information documenting that this was a legitimate card from the Government and not an inducement from a company to rack up

more credit card debt, we believe that yet again, it is not appropriate to blame the user. Even a cursory user study with a few people not intimately involved with the mailing process would most likely have revealed potential negative reactions to such an anonymous and suspicious looking letter, especially in a situation where people are aware of many scams. Furthermore, the confusions and inadvertent card destructions had wider consequences with resources consumed in reassuring doubtful citizens and re-issuing cards. One person with some usability experience embedded in the IRS mailing department could have saved much confusion, card destruction, helpline calls, re-issued cards, and so on.

Another government function is that of democracy itself: "a considerable amount of research suggests that invalid votes, even on a large scale, can result from voter error owing to the ballot design and usability" (Pachón, Carroll, & Barragán, 2017). Simmons and Brennan (2017) report on the "Tell-Us-Once" scheme that reduced repetition in how citizens communicate with government departments to report the death of a partner. In fact, most government services involve some form of citizen interaction that could benefit from a usability focus.

3.2.1 | Embedding into other disciplines

One way for usability issues to be more pervasive would be for them to be distributed across degrees, not necessarily as distinct courses, but embedded into existing courses as guest lectures and case studies. For example, politics students could learn about ballot design, lawyers could learn about errors in human–machine systems, civil engineers could learn about Norman doors, nurses could learn about errors with medical devices, accountants could learn about spreadsheet errors, and journalism students could learn about telling effective and entertaining usability stories. Professions have codes of ethics involving protecting clients and the general public, and often a commitment to ongoing improvement of their processes. This is laudable, but a wider usability movement would remind members of any profession that regardless of their domain and efforts in making the world a better place, bad usability makes everything worse. In contrast, reducing bad usability is often a relatively low cost way of contribution to some wider improvement that members of a profession are working on.

3.2.2 | Example of embedding usability: Into legal settings

Companies can encounter legal liability for releasing faulty or dangerous products. Creating opportunities for yet more litigation carries its own risks, but internally it can be useful for a professional to make a legal case: Nielsen and Budiu (2013) observe that "the malpractice suit would certainly concentrate the executive mindset." The attribution of blame and liability between a designer, developer, and a user is at the center of legal disputes involving technology. We suggest that law students would benefit from the inclusion of a usability-centered treatment of errors in their studies. Is a user to blame for the car crash, machinery malfunction, or oil spill? Is the system designer? Is there a "dark pattern" that constrains or deceives the user in their choice of actions? (Narayanan, Mathur, Chetty, & Kshirsagar, 2020). Understanding what good practice in usability looks like is important for lawyers as it could be "the basis of defense if litigation is brought against a company" (Alper, Arndt, Borgardt, & Johnson, 2019).

4 | DISCUSSION

4.1 | Challenges

As with other suggestions to engage communities to participate in collaborative online information sharing, there are issues of privacy and security (van Zoonen, 2016). Users who contribute bug reports to open source software projects may be aware of the potential for leaking personal information through screenshots: Twidale and Nichols (2005) note the deliberate blurring of screenshots for privacy protection. In a world where less technically experienced users are reporting issues through images and videos there is greater risk of unintentionally revealing private information.

Another class of risks to widespread usability-oriented reporting relates to possible legal complications. Citizens may have concerns around employment contracts or possible retaliatory action (from companies or governments): these concerns could be complicated by the tension between the global nature of digital information and the typically national boundaries of legal jurisdiction.

One example of a successful reporting system is the Aviation Safety Reporting System (ASRS) run by NASA since 1976 (Reynard, Billings, Cheaney, & Hardy, 1986). The core principles of ASRS are voluntary participation, confidentiality protection, a nonpunitive policy and independence (NASA runs the ASRS for the Federal Aviation Administration in the United States). In medicine, all of these four principles are included as aspects of successful reporting systems, while adding: report evaluation by experts, timeliness, and a systems orientation (as opposed to focusing on human errors) (Leape, 2002). These principles align well with our vision for widespread usability

reporting and provide useful guidelines for future implementation. An additional risk to consider is how such a system could be gamed for commercial advantage.

4.2 | What success might look like

It can help to consider how things might be different if the changes we are advocating did occur. Naturally, we would hope that interfaces would be easier to use, and people's frustrations would decrease. Initially, there would be an increase in complaints as people felt empowered to point out problems and felt optimistic that bothering to report them would have an effect. Interface discussions would diffuse into multiple different professional contexts, just as we see discussions about safety, accessibility, and equity across such contexts. Similarly, interface concerns would be embedded into other curricular and professional codes of conduct as they were seen as core parts of those different professions.

We hope that both researchers and practitioners will embrace this change. Indeed, we suspect that many will be able to show that they are already doing the kind of work that we are advocating for increased attention to. Those of us in an academic context can reflect and ask whether we have engaged with academics in other departments on the intersection between usability and their discipline. What could we do in our institutions to increase awareness of the relevance of usability in the teaching of other subjects?

We would also hope to see more iterative improvements of interfaces as usability Kaizen caught on, just as ongoing improvements in both efficiency and reliability occurred in automobile manufacture as a result of the original Kaizen. Many incremental improvements might not be all that visible, as they addressed smaller annoyances with interface use. But in aggregate we would hope to see significant improvements in the effective use of systems. These improvements would not only be measurable, but also measured, as usability metrics became important enough to be developed and to be used in decision making. A true measure of success would be if usability became part of more general conversations, making its way into popular culture through channels such as usability sections on consumer TV programs, discussions in general interest magazines, and consumers asking about usability when considering purchases. As expectations for quality experiences were raised, we might even see comedy sketches about the more egregious standouts of intransigent failures. At the moment what little usability comedy there is has an air of a rather fatalistic inevitability about problems. A more activist stance would be to provoke outrage through humor that this is something that should be fixed rather than simply endured.

4.3 | Relationship to other paradigm shifts and turns

Our proposal is disruptive, but not completely new as there are overlaps with existing practice; in particular, the information science books by Ingwersen and Järvelin (2006) and Fidel (2012), as well as the fields of PD (Bødker et al., 2004), participatory action research (Chevalier & Buckles, 2013) and design thinking (Kolko, 2018). However, these methods are usually applied at a small scale. For example, PD typically involves a small group of stakeholders co-designing for a larger intended user group. In contrast, we are advocating for a significant proportion of society to be involved, and to be able to participate without being invited.

There have been many different approaches (proposed paradigms and "turns") to better embrace end users, their views, and activities (Bawden & Robinson, 2012; Hartel, 2019; Nolin & Åström, 2010). One particular case was the cognitive turn exemplified by Dervin and Nilan (1986), often cited as highlighting a paradigm change. However as Talja and Hartel (2007) show, Dervin and Nilan's paper was not quite as revolutionary as it is sometimes claimed to be—there had indeed been a number of user-centered studies of information use (particularly by scholars and scientists) stretching back over several decades. Hartel's (2019) review also reminds us that there can be important developments that still may not be regarded by some as paradigm shifts but can nevertheless provoke interesting, even provocative discussions.

5 | CONCLUSION

We have proposed a radical way to address the annoying persistence of problematic interfaces. This approach has the potential to revolutionize how we conceptualize the role of interfaces in information science and the deceptively simple notion of "usability." The approach of Everyone Everywhere will not only help in creating a culture more open to widening the accessibility of information through usability, but enable more people to realize that their usability problems are not due to inadequacies in themselves but in current designs. This is a shift from user-centered design to user activist design. The approach reinforces the historic impact that information science has had on HCI by bringing a critical perspective to the details of exactly how people use information and

information systems—and how they might want something better to help meet their needs. Additionally the rich history of librarianship and the philosophical commitment to service and access in all ways for all people has much to inspire us in a world where use of computer technologies mediated via interfaces consumes so much of our time and attention—often wastefully.

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